Electromagnetics

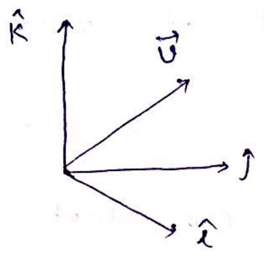
Centre for Engineering Studies

DPP-2 (Vectors)

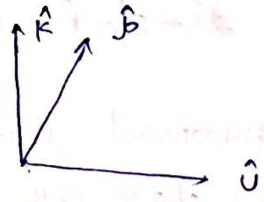
Q-1. If $\vec{r} = r\hat{r}$ and $\nabla\cdot(r^n \hat{r}) = 4r^{n-1}$

Value of $n =$ ____

Q-2. A vector $\vec{v} = 2\hat{i} + 2\hat{j} - 3\hat{k}$ is represented in cartizian co-ordinate system as shown below.



A new orthonormal cordinate system is shown below



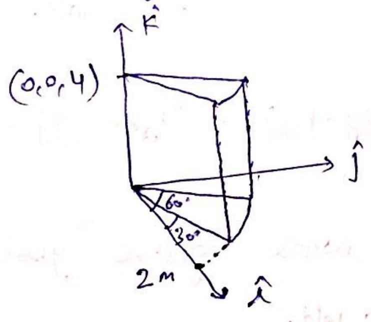
where $\hat{u} = \frac{1}{\sqrt{2}}\hat{i} + \frac{1}{\sqrt{2}}\hat{j}$ and $\hat{p} = \frac{-1}{\sqrt{2}}\hat{i} + \frac{1}{\sqrt{2}}\hat{j}$

now the vector $\vec{v}$ in new co-ordinate system is transformed to

(a) $2\hat{u} + 2\hat{p} - 3\hat{k}$ (b) $2\sqrt{2}\,\hat{j} - 3\hat{k}$ (c) both a & b (d) None

Q-3. Volume charge density of the region shown below is $4rz^2\sin\phi$ C/m^3

Find the total charge in the volume ____ C



Q-4. Find distance between two points $P(2, 30°, 4)$ and $Q(4, 60°, 2)$ ____ m.

Q-5. Evaluate $\oint \vec{r}\cdot\vec{ds}$ over the closed surface of the cube bounded by $0 \le x \le 1$, $0 \le y \le 1$ and $0 \le z \le 1$ where $\vec{r}$ is the position vector of any point on the surface of the cube ____

Q-6. Over the closed surface of a sphere of radius 2 $\oint \hat{r}\cdot\vec{ds}$ = ____

(a) 0 (b) 16π (c) 8π (d) $16/3\,\pi$

Q-7. Given a vector function $\vec{F} = (x+K_1 z)\hat{i} + (K_2 x - 3z)\hat{j} + (x + K_3 y + K_4 z)\hat{k}$

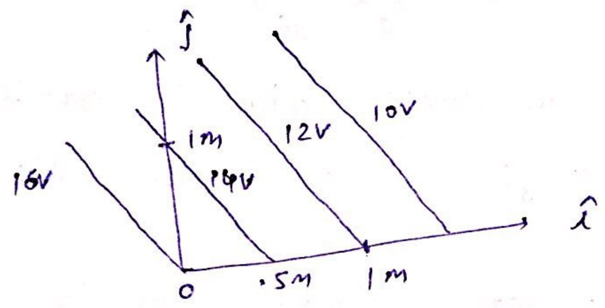
Given that $\vec{F}$ is irrotational find $K_1 + K_2 + K_3$ = ____

Q-8. for the above question find K_4 if above vector field is also solenoi[dal] ____

Q-9. Find angle between two vector $\bar{U}$ & $\bar{V}$ at point $(2, 30°, 60°)$

$\bar{V} = 2\hat{i} + 3\hat{j} - \hat{k}$ $\bar{U} = 4\hat{r} + 2\hat{\theta} - \hat{\phi}$ ____ degrees.

Q-10. The equipotential lines are shown below. Given that potential does not change with z-direction. and $E = -\nabla V$



Find pot. difference between points P(2,1,1) and Q (4,2,3)

____ volt.

Q-11. Given a vector function $\vec{F} = (3y - K_1 z)\hat{i} + (K_2 x - 2z)\hat{j} - (K_3 y + z)\hat{k}$

Given that $\nabla \times \vec{F} = 0$

Determine a scalar potential V whose negative gradient equals F

and V at (2,4,2) is 40 volt.

(a) $-3xy + 2yz + \frac{z^2}{2}$ (b) $-3xy + 2yz + z^2/2 + 40$

(c) $-3xy + 2yz + z^2/2 + 46$ (d) None